Microhydromys musseri n. sp., a New Murid (Mammalia) from the Torricelli Mountains, Papua New Guinea

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Microhydromys musseri n. sp. differs greatly from the only previously described species of *Microhydromys* (*M. richardsoni*) in its larger size, brown dorsum with a markedly contrasting venter, broader skull, palate morphology, and dentition details. Both species however share synapomorphies not seen in other hydromyine murids. *Microhydromys musseri* n. sp. is thus far known from a single specimen collected near the summit of Mt Somoro, Torricelli Mountains (part of the North Coast Ranges). It is the third mammal species endemic to these ranges to be described. Three additional specimens of *Microhydromys richardsoni*, which was previously known only from the holotype, are described. These add significantly to knowledge of the species distribution and morphology.

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INTRODUCTION

The murid subfamily Hydromyinae consists of 10 genera in the Australo-Papuan region. Thomas (1898) and Misonne (1969) have referred Asian taxa to the Hydromyinae, but Musser (1982) notes that it is not yet clear if any of these taxa do indeed represent part of the hydromyine radiation. All of the Asian taxa are readily distinguishable from members of the Australo-Papuan group and none resemble the species of *Microhydromys*. For this reason, and because of their uncertain status, I have restricted comparisons of the new species to Australo-Papuan taxa.

Within the New Guinean Hydromyinae are a group of six species, placed in four genera, that are known as microhydromyines. They are small, shrew-like murids with short, sleek coats, tiny eyes and pointed snouts. Included are some of the rarest and least known Melanesian mammals. The genera *Mayermys* and *Neohydromys* are monotypic, while *Pseudohydromys* includes two similar, probably parapatric species. *Microhydromys* includes two species that differ greatly in morphology, one of which is described here as new.

Previous taxonomic work upon microhydromyines has been limited, and it is not yet clear whether these species represent a monophyletic group, or are simply phenetically similar and paraphyletic. Likewise, the generic limits are in some cases poorly understood, and it is possible that in future some genera will be synonymized.

Microhydromys richardsoni Tate and Archbold, 1941 was described on the basis of a single adult male taken at an altitude of 850m near Bernhard Camp, Idenburg River, Irian Jaya. It is one of the more distinctive microhydromyines, possessing grooved upper incisors and a broad skull with a short rostrum. A brief mention of the existence of an additional specimen (Menzies and Dennis, 1979) constitutes the only other reported occurrence of this species.

In this work a new species of *Microhydromys*, from the North Coast Ranges, is described; descriptions of 3 additional specimens of *M. richardsoni* are provided. Although the new species is known only from a single specimen its description as a new

taxon is considered justified on the basis of its highly distinctive morphology. The likelihood of additional material being found in the near future is also low.

Materials and Methods

Dental terminology follows Musser (1981), and colours where capitalized follow Smithe (1974). Measurements are in millimitres and weights in grams. Abbreviations are as follows: AM M, Australian Museum mammal specimen; AMNH, American Museum of Natural History mammal specimen; BBM, Bishop Museum mammal specimen.

Systematics

Microhydromys Tate and Archbold, 1941

Microhydromys musseri n. sp

(Figs 1-2, Table 1)

Holotype and Type Locality: BBM101737, puppet skin and skull with dentaries of an adult male, collected on 12 November 1972 by A. B. Mirza at 1,350m on Mt Somoro (3° 22′S, 142° 09′E), Torricelli Mountains, West Sepik Province, Papua New Guinea.

Etymology: For Dr Guy Musser, who has contributed so abundantly to systematic research on the murids of Asia and Melanesia, and who has so greatly increased our understanding of the shrew-like murids of the region.

Diagnosis: *Microhydromys musseri* n. sp. can be distinguished from *M. richardsoni* in the following ways: it is larger (Table 1); the dorsum is Ochre Brown and the sharply demarcated venter Cinnamon (as opposed to the nearly uniform grey colouration of *M. richardsoni*); there is no longitudinal groove on the upper incisors; the palate is more deeply concave; the skull is absolutely and relatively broader; I/1 is less procumbent; a posterior cingulum is present on M/1.

Description: Fur short and dense, tail and ears appearing naked to the unaided eye. Dorsum near Ochre Brown, grading to Cinnamon Brown on flanks. Venter sharply demarcated and Cinnamon with two small, irregular white patches on thorax. Throat Cinnamon, crown of head Fuscous. Eyes surrounded by a circle of blackish hairs. Most vibrissae pale, but a few black; similar in length, distribution and density to those of other microhydromyines such as *M. richardsoni* and *N. fuscus*. Hands and feet thinly furred with pale hairs on dorsal side. Tail slightly paler below than above and mottled with light patches becoming prominent distally. Flesh of ears dark. Tail scales ill-defined but form regular rings with a single hair per tail scale. Flesh of the hands and feet shrivelled, but enough can be seen to determine that the pads of the forefeet were striated. Tiny rhinarium naked, toes unwebbed.

Upper incisors ungrooved and enamel orange. Lower incisors with paler orange enamel and less procumbent than in most other hydromyines. Molars heavily worn, with much crown detail lost. M1/ elongate, narrow, subrectangular. T2 large, obvious, much worn. A slight groove on the anterolingual face separates T1 and T2. Distinct enamel basin separates anterior and median lophs. Wear has obliterated almost all detail distal to this point. However, a slight groove discernable between median and posterior lophs on buccal face. T4 present as well-developed ridge. All M2/ crown details obliterated by wear. M2/ triangular in outline, with apex facing posteriorly. M/1 heavily worn. Protolophid horseshoe-shaped dentine basin surrounded by remnant of enamel crown. Hypolophid similar, but subrectangular shaped basin. Posterior cingu-

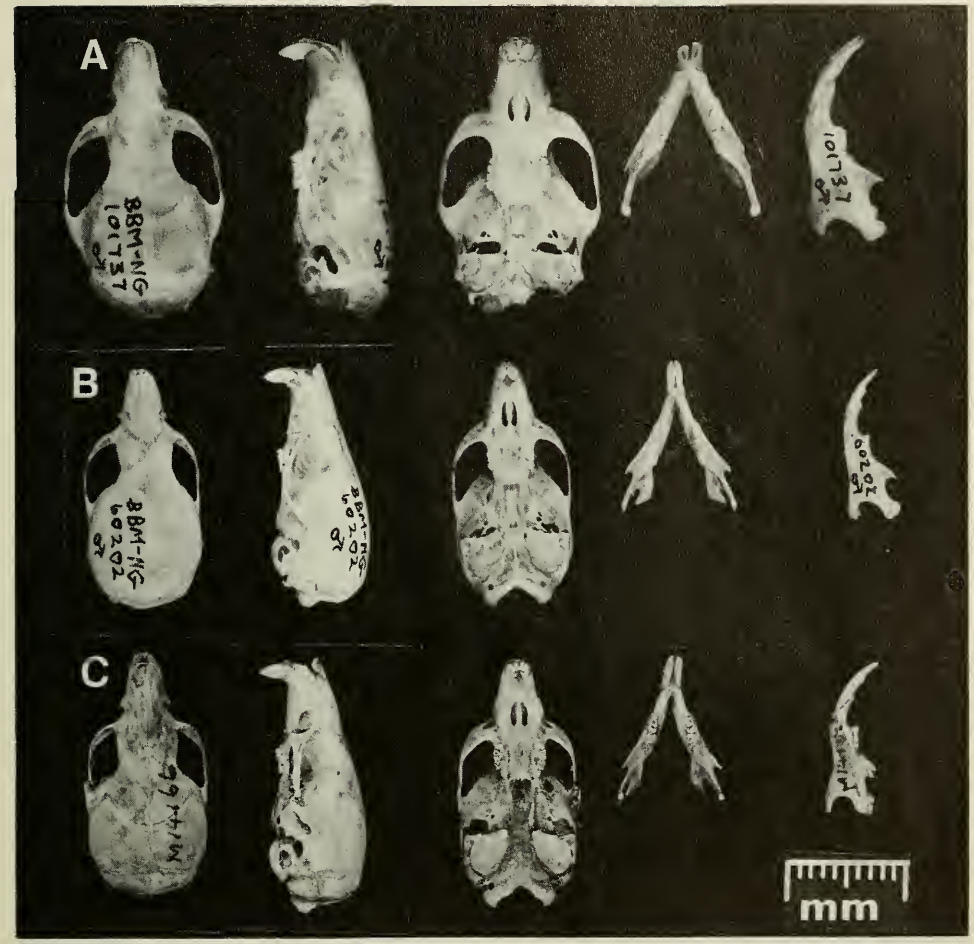

Fig. 1. The crania of **A**, *Microhydromys musseri* (holotype) BBM 101737. **B**, BBM 60202, *M. richardsoni*. **C**, AM M14166, *M. richardsoni*.

lum large and ovoid, positioned at anterolingual margin of tooth. M/2 smaller than M/1. Protolophid subrectangular and heavily worn basin. Hypolophid crescent shaped basin. Lophids separated by simple interlophid valley.

Cranium slightly damaged; left occipital condyle sheared off and basoccipital shattered then reglued. Rostrum shorter than in other microhydromyines, and broadened posteriorly. Premaxillae do not extend beyond incisors. Masseteric foramen lunette shaped and sloping anterodorsally, but with vertical orientation at posterior end. Infraorbital foramen moderate in size, not expanded as in *Hydromys*, *Parahydromys* and *Crossomys* species. Incisive foramina short and bowed, posterior ends located just posteromedial to zygomatic plates. Zygomatic plates broad and flared laterally. Zygomatic arch thin. Braincase moderately inflated. Bregmatic anteroposteriorly very short but broad. Palate deeply excavated, with molar alveolar margin raised into a ridge which extends well ventral to palate floor. Palatal foramina partially obscured by overhang of this ridge. Well-defined grooves run from palatal to incisive foramina. Left pterygoid broken away. Otic notch large, bulla unexpanded.

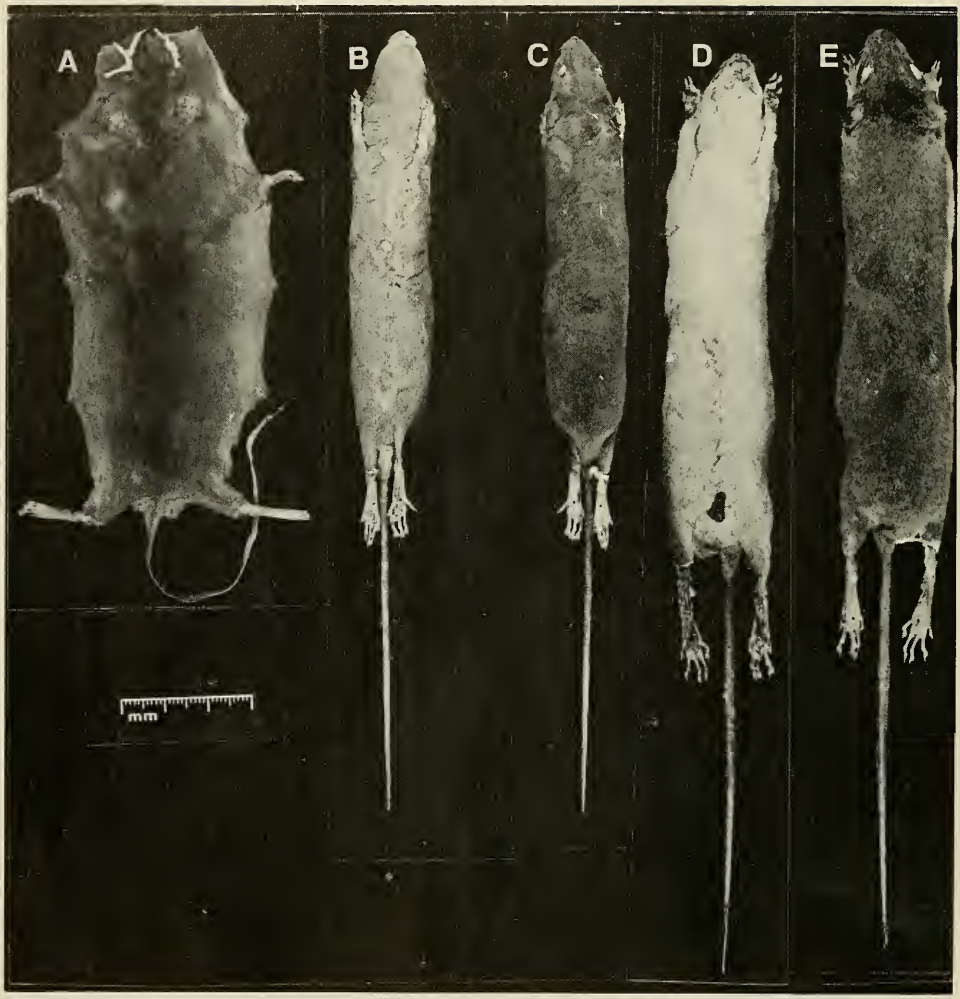

Fig. 2. Skins of **A**, *M. richardsoni* (AM M14166) **B**, ventral view and **C**, dorsal view of *M. richardsoni* (BBM60202), **D**, ventral view and **E**, dorsal view of *Microhydromys musseri* n. sp. (holotype) BBM101737.

Discussion

Systematics

The assignation of the newly described species to the genus *Microhydromys* is based upon a cladistic interpretation of aspects of hydromyine morphology. Phenetically, *M. musseri* n. sp. and *M. richardsoni* appear to be rather different. However they share a number of key, apparently derived, features that are either rare or are not seen elsewhere among the Hydromyinae. These include the following.

1) The M1/ is extremely narrow and elongate, and more nearly rectangular in occlusal outline than in other hydromyines. This feature is unique in the subfamily and is not seen among other Australo-Papuan murids. Thus on the basis of outgroup comparison this feature is likely to be derived.

2) The lingual end of the interloph valley between the anterior and medial lophs of M1/ is very narrow, and partially closed off by a low ridge from T1. The entire lingual

margin of the tooth thus forms a continuous linear face which is parallel with the skull midline. Again, this feature is not seen in other hydromyines and is doubtless derived.
3) The rostrum is short relative to skull length and yet the interorbital canals are not greatly enlarged. The only other hydromyines with such a short rostrum are the species of *Hydromys*, *Crossomys* and *Parahydromys* (here called the '*Hydromys* group'). These very large hydromyines however all possess greatly enlarged infraorbital canals. Most murids (including the plesiomorphic hydromyine *Leptomys elegans*) have longer rostra. Thus it seems likely that the presence of a short skull is a derived feature. Because in other aspects the morphology of members of the '*Hydromys* group' and the species of *Microhydromys* is so different it seems likely that this similarity is due to convergence.
4) The palatal foramina are partially closed posteriorly and are narrow. Again, these features are unique in the subfamily and on the basis of outgroup comparison are likely to be derived.

Other aspects of morphology of the two *Microhydromys* species are however not shared between these taxa, but are either unique, or are shared by one or the other species with other hydromyines. These features are interpreted as being either retained symplesiomorphies or as being due to convergence; the features are as follows. The pelage of *M. musseri* n. sp. is bright. Its warm brown and cinnamon tones and sharply contrasting venter are not approached in any other microhydromyines. Among other hydromyines, only the species of *Leptomys* and one species of *Paraleptomys* possess such colouration. The species of *Leptomys* are particularly plesiomorphic hydromyines in many aspects of their morphology, and no other features would suggest a relationship with *Microhydromys*. Thus this feature may well be due to either convergence or else be a retained symplesiomorphy.

Another striking feature of *M. musseri* n. sp. that is most closely approached only in apparently distantly related taxa is the extremely concave palate. Only in *Xeromys myoides*, among other hydromyines, is the condition seen in *M. musseri* n. sp. approached. However, here details of actual palatal structure differ, suggesting that palatal concavity in these taxa is the result of convergence. The palatal foramina in *X. myoides* are not overhung by the ridges supporting the cheekteeth as in *M. musseri* n. sp., but are subovate and open. Furthermore, in cross section the palate of *M. musseri* is more angular than in *X. myoides* (where the cross section is arch shaped).

Overall skull shape at first suggested that a close relationship might exist between *M. musseri* n. sp. and the '*Hydromys* group' species, for these taxa have a short rostrum and are superficially similar in skull shape. However, in species of the '*Hydromys* group' T1 and T4 on M1/ are not extended posteriorly as they are in other New Guinean hydromyines. Posterior extension of these cusps must be regarded as derived, as it is not seen in plesiomorphic murid groups. This suggests that all hydromyines except members of the '*Hydromys* group' may be monophyletic, and that similarities between *M. musseri* n. sp. and the species of *Hydromys* are either plesiomorphic or due to convergence.

A final striking feature of *M. musseri* n. sp. is the presence of a distinct and large posterior cingulum on M/1. Only in the species of *Leptomys*, *Paraleptomys* and *Neohydromys* among hydromyines is this structure otherwise retained. The widespread presence of a posterior cingulum on the lower molars of other murid groups (including all non-hydromyine Australo-Papuan taxa) suggests that the loss of this structure is derived. That the posterior cingulum appears to have been retained in several unrelated hydromyine taxa indicates that its loss within the subfamily has occurred independently in several lineages.

Microhydromys richardsoni possesses one feature that is unique in the Hydromyinae. This is the presence of longitudinally grooved incisors. Such grooved incisors are, however, seen in a number of other murid taxa, such as the species of *Mylomys*, *Pelomys*

and *Golunda*. In *Vandeleuria oleracea* the incisors are only occasionally grooved, while in *Mus xenodontus* only one incisor is grooved. Misonne (1969) suggests that this indicates that the presence of grooves on the upper incisors of murids is under relatively simple genetic control and that it has only limited systematic importance. These data, together with the fact that the grooved incisors of *M. richardsoni* are unique (autapomorphic) among near relatives, suggests that not too much importance should be placed upon this feature in phylogenetic analysis.

In summary, it would appear that *M. musseri* n. sp. and *M. richardsoni* are each other's nearest relatives, but that both possess a number of independent specializations not seen in the other. This may in turn indicate that these taxa have been evolving separately for a considerable period of time. On this basis, a case could be made for either placing each in a monotypic genus, or retaining both in *Microhydromys*. The latter course has been chosen because I feel that the recognition of yet another monotypic genus of microhydromyine murid is not desirable until relationships within the group are clarified; furthermore such a decision would not indicate the nature of the relationship between *M. richardsoni* and *M. musseri* n. sp.

Biology and Zoogeography

A note on the label of the type specimen of *M. musseri* n. sp. indicates that it was taken at an altitude of 1,350m in a snap trap in 'forest'. At altitudes above about 1,200m Mt Somoro and the other high peaks of the North Coast Ranges are covered by mossy forest which differs sharply from the forest at lower altitudes. It is now becoming clear that these forests harbour a distinctive mammal fauna unlike that found anywhere else in New Guinea. The first endemic mammal to be described from these ranges (in this case the Cyclops Mountains) was also a hydromyine, *Paraleptomys rufilatus* Osgood, 1945. It has subsequently been found in the Mt Somoro area. Zeigler (1981) described a second endemic, the large petaurid *Petaurus abidi* from Mt Somoro. This paper describes a third endemic, which is yet another hydromyine. Furthermore, recent fieldwork undertaken in the Somoro area has revealed the presence of additional, as yet undescribed, endemic mammal species. In addition to these taxa, a number of slightly more widespread species are found in this habitat. These include *Pseudocheirops albertisii*, also known from the Vogelkop and Japen Island, and *Dendrolagus inustus*, which has a similar distribution. The area of mossy forest available to these species in the Torricelli Mountains is tiny (ca. 39 km^2), but in the recent past was probably larger, when Ice Age cooling depressed altitudinal zones. However, it appears that at no time in the last few million years was this region in contact with the mossy forests of the Central Cordillera. This is reflected in the 'unbalanced' assemblage of species in this habitat. For example, no endemic dasyurids are known from these ranges, while the Central Cordillera has 6 species found exclusively at mid-high altitudes. Perhaps the fact that two out of the three described endemic mammals from the North Coast Ranges are insectivorous hydromyines reflects this lack. In the absence of the insectivores and carnivores which inhabit this forest type elsewhere, it may well have been that the hydromyines that could invade the habitat underwent a modest radiation. Whatever the case, it is apparent that no similar event happened elsewhere, as no endemic hydromyine species have been found on other isolated mountain ranges in New Guinea.

Additional Specimens

The only detailed information previously published regarding *Microhydromys richardsoni* is that contained in the type description and paraphrases of it. The holotype is an adult male, taken, presumably in a snap trap (the posterior part of the skull is broken in a way that suggests snap trap damage), at an altitude of 850m 4km SW of Bernhard

camp on the Idenburg River, Irian Jaya on 16 March 1939. Only three further specimens have been collected since that time, and two of these have been examined for this study. The first collected is an adult male (AMNH 198790). This was snap trapped under a small log in secondary growth at an altitude of 670m at Wanuma in the Adelbert Mountains, Madang Province by A. C. Zeigler on 21 October 1967. I have been unable to examine this specimen but Dr G. Musser kindly made the following notes for me; the terminal 35mm of the tail is mottled white, and the skull is so shattered that measurements could not be made. The Adelbert Range is a small, relatively low mountain range (most of it barely exceeding 1,000m) which is isolated from the New Guinean Central Cordillera.

The second additional specimen to be collected is another adult male (BBM60202). This was snap trapped in an area of secondary forest-Eucalypt savannah near Sirinumu Dam, Sogeri area, Central Province Papua New Guinea on 28 October 1968. Sirinumu Dam lies at an altitude of *c.* 550m. This is a most unexpected locality, as the Idenburg River and Adelbert Range specimens must have come from much wetter forest. The measurements of this specimen closely approach those of the holotype for the most part (Table 1). The pelage and cranial morphology are also similar to that of the holotype. They differ primarily in that: approximately 37mm of the distal part of the tail is white tipped as opposed to 10mm in the holotype; the grey of the dorsum is interrupted by irregular and inconspicuous ginger blotching (the individual blotches being 1-2mm in diameter).

TABLE 1

Measurements for the 5 known specimens of Microhydromys. *Measurements for AMNH 152079 are from Tate (1951). Measurements in mm and weight in grams. l = length, w = width, inc. = incisive*

Measurement /Weight	*M. musseri* BBM-NG 101737	AMNH 198790	*M. richardsoni* AMNH 152079	AM M 14166	BBM-NG 60202
head body l.	108	83	80	86	86
tail vent l.	101	84	92	79	83
hindfoot (su) l.	22	19	20	—	19
ear (n) l.	13	11	8	—	12
weight	—	9	—	12	—
condylobasal l.	23.6	—	—	20.2	19.6
bizygomatic w.	13.4	—	9.2	10.1	9.6
palate l.	13.6	—	10.0	9.5	9.7
rostral w.	5.7	—	—	4.1	4.0
inc. foramen l.	2.2	—	2.5	2.1	1.9
interorbital w.	5.2	—	4.4	4.6	4.2
nasal l.	8.0	—	6.4	7.0	5.9
maximum nasal w.	3.0	—	2.6	2.6	2.3
mastoid w.	10.7	—	9.4	8.8	9.3
bulla l.	4.4	—	3.8	4.2	4.2
M1-2/ l.	2.9	—	2.4	2.0	1.9
M1-1/ w. internal	3.5	—	2.4	2.7	2.7
M1/ l.	2.1	—	1.6	1.4	1.2
M1/ w.	0.9	—	0.8	0.8	0.6
M2/ l.	0.8	—	0.8	0.7	0.7
M2/ w.	0.8	—	0.7	0.6	0.6

The most recently collected specimen is AM M14166. It is an adult female snap trapped on 18 September 1979 at 1,450m on the southern slopes of Mt Sisa, Southern Highlands Province by P. Dwyer. Although most measurements are similar to those for the other *M. richardsoni* individuals known, it differs in a number of ways. The nasals are

longer and the mastoid width narrower than in the male specimens (Table 1). The palate does not extend as far posteriorly behind M2/ as in the Sogeri specimen. The skin of the Mt Sisa specimen is flat. It closely resembles that of the Sogeri individual except that it lacks the ginger blotching and has a small patch of pure white hairs on the throat. The most distal 25mm of the tail is pure white, while a light and dark mottled area extends a further 30mm proximally.

It is unclear as yet whether the differences between AM M14166 and the other *M. richardsoni* specimens represent sexual dimorphism, intra, or possibly even interspecific variation. However from the specimens described here it is clear that this species, or taxa closely related to it, are relatively widely distributed across New Guinea, both geographically and in differing environments.

Conclusion

Microhydromys musseri n. sp. is described. Known from a single specimen collected in mossy forest high in the Torricelli Mountains, it differs in many aspects of its morphology from *M. richardsoni*. Three additional specimens of *M. richardsoni* are described. They indicate that this species has a wide geographic distribution and that it exhibits considerable morphological variation. *Microhydromys richardsoni* can inhabit drier habitats than had previously been suspected.

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